**Service area optimization modeling**

The location of the facility was optimized for maximum accessibility to all consumers within the road network using ArcView GIS and the Network Analyst extension. Spatial accessibility models of a service point located at different points of the territory are shown in Fig. 5-6.

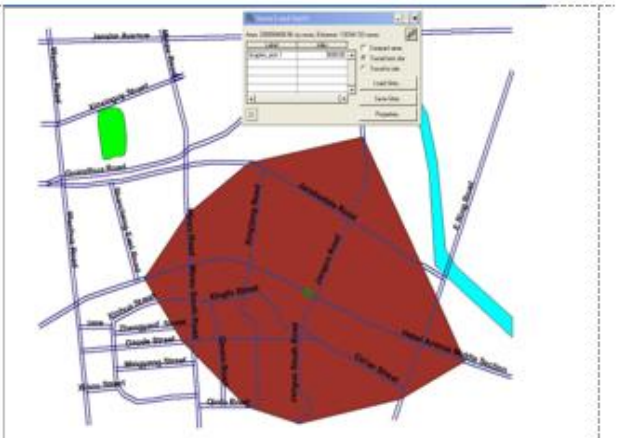

Figure 5. – Optimization of service areas for different location of the service point

Figure 6. – Optimization of service areas for different location of the service point

Based on the above, it can be concluded that GIS technologies and software can be effectively used in the activities of emergency services to solve network spatial problems in the operational search for the nearest service points and modeling optimal routes for special transport in order to minimize response time and reduce material costs for ensuring the activities of emergency services.

**References**

1. Хаксхолд, В. Е. Введение в городские географические информационные системы / В. Е. Хаксхолд; пер. с англ. – New York: Oxford University Press, 1991. – 317 с.

2. Longley, P. A. GIS: Teoria i praktyka / P. A. Longley [et ctr.] – Warszawa: Wydawnictwo Naukowe PWN, 2006. – 519 s.

3. Лаптенок, С. А. Пространственное моделирование экологических процессов средствами географических информационных систем :учебно-методическое пособие. – Минск: ИВЦ Минфина, 2020. ISBN 978-985-880-097-0. – 116 с.

## USE OF COMPUTATIONAL TECHNOLOGIES IN MODERN CARDIOLOGY

**Mazalkova M.**

Molloy University, Rockville Centre, New York, USA

**Relevance.** The last decade has been marked by the widespread implementation of computational technologies (CT) in cardiology, which has significantly enriched the diagnosis and treatment of cardiovascular diseases. Computational cardiology,

through the use of cardiovascular imaging and informatics, enables accurate diagnosis of myocardial diseases using techniques such as echocardiography, cardiac magnetic resonance imaging, and computed tomography.

**The aim:** a brief analysis of scientific publications on the topic of the use of computer technologies in modern cardiology.

**Research methods.** The electronic database PubMed was used to search for information (https://pubmed.ncbi.nlm.nih.gov). PubMed comprises more than 37 million citations for biomedical literature from MEDLINE, life science journals and online books. Citations may include links to full text content from PubMed Central and publisher web sites. The publications that best matched the research topic were selected for analysis. The search data are presented as of February 21, 2025.

**Keywords:** computational technologies, cardiology.

**Results.** The database identified more than 6,500 scientific publications on the research topic. Over the last five-year period alone, 3,432 papers were published, accounting for 53% of the total number, confirming the relevance of the research topic. The above data indicate a high degree of interest among specialists in the development and implementation of digitalization in cardiology.

The latest publication by Tsampras T. [1] indicates that one of the most promising areas of diagnostics and prognosis of cardiovascular diseases is radiomics – a science that combines radiology, mathematical modeling and deep machine learning. The main concept of radiomics is image biomarkers which are parameters calculated based on the texture analysis of digital images that characterize various pathological changes. With the help of image biomarkers, a quantitative assessment of the results of digital visualization methods computed tomography, cardiac magnetic resonance, echocardiography, and single-photon emission computed tomography) is carried out.

Automatic myocardial tissue segmentation using deep learning algorithms improves the efficiency and consistency of analysis of large patient populations.

Computed tomography (CT) of the heart plays an important role in the diagnosis of coronary artery disease. This technique allows for the detection of coronary artery lesions with high diagnostic accuracy, making it a first-line diagnostic method for chronic ischemic heart disease. Recently, dual-energy CT has become widely used, which allows for a functional assessment of the myocardium and coronary arteries. Dual-energy imaging, myocardial perfusion assessment, and delayed contrast assessment additionally identify indications for myocardial revascularization. Dual-energy CT allows for a detailed assessment of myocardial perfusion and viability, helping to identify lesions and determine revascularization procedures for a comprehensive assessment of the heart, offering a new approach to the treatment of ischemic heart disease [2].

The latest publications also reflect the problem of modernization of higher medical education towards digitalization. As the quality and availability of virtual reality digital technologies improves, their potential applications in medical education are increasingly being studied. The authors of the publication proposed a dynamic platform developed for teaching cardiac embryology. This platform

enables interaction between teachers and students and ensures participation in learning outside of traditional classrooms. The study involved 143 medical students. The high efficiency of using this dynamic platform in higher medical education was noted [3].

**Conclusions.** Based on the conducted brief analysis of publications on the topic of introducing digital technologies in cardiology, it can be concluded that this topic is in the area of close attention of researchers from many countries of the world community. It is enough to note that at the beginning of this year alone, 193 publications on the research topic were identified in the PubMed database. Modernization of higher medical education towards digitalization has great prospects.

**Literature**

1. Tsampras, T. Deep learning for cardiac imaging: focus on myocardial diseases, a narrative review / T. Tsampras, T. Karamanidou, G. Papanastasiou [et al.] // Hellenic Journal of Cardiology. – 2025 Jan-Feb. – Vol. 81. – P. 18-24. – doi: 10.1016/j.hjc.2024.12.002.

2. Ueyama, T. Evaluation of revascularizable vessels using dual-energy cardiac computed tomography: A case report / T. Ueyama [et. al.] // Radiology Case Reports. – 2025. – Vol. 20. – Is. 4. – P. 1932-1936. – doi: 10.1016/j.radcr.2025.01.002.

3. Kunz, M. Embryonic heart development as an immersive experience: Unveiling learning effects and influential factors in virtual learning environments / M. Kunz [et al.] // Computers in Biology and Medicine. – 2025. – Vol. 187. – P. 109638. – doi: 10.1016/j.compbiomed.2024.109638.